



SMI Application Level Statistics and KPI

- [Subscriber Microservices Infrastructure Monitoring Key Performance Indicators, on page 1](#)
- [SMI Bulkstatistics Support, on page 5](#)
- [Appendix A: Bulkstatistic KPI Details, on page 6](#)

Subscriber Microservices Infrastructure Monitoring Key Performance Indicators

This section describes the Key Performance Indicators (KPIs) that are useful for tracking the overall health of Subscriber Microservices Infrastructure (SMI).

Licensing KPIs

The following custom statistics and queries enable you to monitor the license count for a product's entitlement.

entitlement status

| | |
|--------------------|--|
| Description | Captures the current requested license counts for a product's entitlement. |
| Metric Type | Gauge |
| Data Type | Int |
| Statistics | <pre>entitlement_status{enforce_mode="Eval"}</pre> <p>NOTES:</p> <ul style="list-style-type: none"> • <code>enforce_mode</code>: The current enforcement mode used by an entitlement. For example, Invalid, Init, Waiting, InCompliance, OutOfCompliance, Overage, Eval, EvalExpired, AuthorizedPeriodExpired, InvalidTag, ReservedInCompliance, and NotAuthorized • <code>tag</code>: The entitlement tag that reports to the smart licensing server. For example, regid.2019-03.com.cisco.SMI-TEST-ALL, and 1.0_63366461-0177-4c93-8eea-c9b02e9843f8. |

System Status KPIs

The following custom statistics and queries enable you to monitor the status of the system.

system_mode

| | |
|--------------------|---|
| Description | Indicates the current mode the system is running on. |
| Metric Type | Gauge |
| Data Type | Int |
| Statistics | <p>system_mode</p> <p>NOTES:</p> <ul style="list-style-type: none"> • 0: The system is in shutdown mode. • 1: The system is running. • 2: The system is under maintenance. • -1: The system mode is unknown. |

system_synch_running

| | |
|--------------------|---|
| Description | Specifies whether the system configuration synch process is running or not. |
| Metric Type | Gauge |
| Data Type | Int |
| Statistics | <p>system_synch_running</p> <p>NOTES:</p> <ul style="list-style-type: none"> • 1: The system configuration sync process is running. • 0: The system configuration sync process is running. |

system_running_percent

| | |
|--------------------|---|
| Description | Captures the percentage of the system currently in use. |
| Metric Type | Gauge |
| Data Type | Percent |
| Statistics | system_running_percent |

System Configuration KPIs

The following custom statistics and queries enable you to monitor the system configuration.

system_configuration_backup_total

| | |
|--------------------|---|
| Description | Captures the total number of system configuration backups that are executed. |
| Metric Type | Counter |
| Data Type | Configuration Count |
| Statistics | <pre>irate(system_configuration_backup_total[1m])</pre> <p>NOTES:</p> <p><code>status</code>: The status of the executed backups. For example, success or error.</p> |

configuration_change_total

| | |
|--------------------|---|
| Description | Captures the total number of configuration changes that are executed. |
| Metric Type | Counter |
| Data Type | Configuration Count |
| Statistics | <pre>sum(irate(configuration_change_total[1m]))</pre> |

Prometheus KPIs

The following custom statistics and queries enable you to monitor the Prometheus KPIs.

helm_chart_deploy_success

| | |
|--------------------|--|
| Description | Captures the helm chart deployment status. |
| Metric Type | Gauge |
| Data Type | Int |
| Statistics | <pre>chart="chart_name",release="release_name",chartVersion="chart_version"</pre> <p>NOTES:</p> <ul style="list-style-type: none"> <code>1</code>: The helm chart deployment is successful. <code>0</code>: The helm chart deployment failed. |

system_synch_error

| | |
|--------------------|--|
| Description | Specifies the status of system synchronization. |
| Metric Type | Gauge |
| Data Type | Int |
| Statistics | <p>system_synch_error</p> <p>NOTES:</p> <ul style="list-style-type: none"> • 1: The system synchronization is successful. • 0: The system synchronization failed. |

system_synch_pending

| | |
|--------------------|---|
| Description | Specifies the status of the system synchronization progress. |
| Metric Type | Gauge |
| Data Type | Int |
| Statistics | <p>system_synch_pending</p> <p>NOTES:</p> <ul style="list-style-type: none"> • 1: The system synchronization is pending. • 0: The system synchronization is not pending. |

system_configuration_backup_pending

| | |
|--------------------|--|
| Description | Specifies the status of the DB to configmap backup progress. |
| Metric Type | Gauge |
| Data Type | Int |
| Statistics | <p>system_synch_backup_pending</p> <p>NOTES:</p> <ul style="list-style-type: none"> • 1: The backup of DB to configmap is pending. • 0: The backup of DB to configmap is not pending. |

helm_repository_status

| | |
|--------------------|--|
| Description | Specifies the status of the helm repositories. |
| Metric Type | Gauge |

| | |
|-------------------|--|
| Data Type | Int |
| Statistics | helm_repository_status NOTES: <ul style="list-style-type: none"> • 1: The helm repository is reachable. • 0: The helm repository is unreachable. |

Statistics from Open Source Collector Services

SMI exposes statistics from the following Open Source Collector Services:

Table 1: Open Source Collector Services

| Collector Service | Documentation |
|--------------------|---|
| kube-state-metrics | https://github.com/kubernetes/kube-state-metrics/tree/release-1.8/docs |
| cAdvisor | https://github.com/google/cadvisor/blob/v0.33.1/docs/storage/prometheus.md |
| node exporter | https://github.com/prometheus/node_exporter/tree/v0.18.1 |

Please refer to the collector documentation for more information on the statistics supported.

SMI Bulkstatistics Support

SMI supports the configuration of bulkstatistics through the CEE Ops Center.

The following bulkstatistics are considered KPIs. It is recommended that they be configured for effective monitoring of your deployment:

- system-mode
- system-running-percent
- configuration-change-total
- cpu-core-count
- node-load-1
- node-load-5
- node-load-15
- node-disk-rate-read-bytes
- node-disk-wite-read-bytes
- node-memory-free-bytes
- network-transmit-bond-bytes-total

- network-receive-bond-bytes-total
- network-carrier-bond-changes-total
- network-transmit-ens-bytes-total
- network-receive-ens-bytes-total
- network-carrier-ens-changes-total
- k8s-pods-status
- active-alerts
- filesystem-root-avail-bytes
- filesystem-data-avail-bytes
- kubelet-running-pod-count
- entitlement-status
- memory-used
- cpu-idle
- cpu-softirq
- cpu-system
- cpu-iowait
- cpu-steal
- cpu-user
- kubelet-node-status
- network-errors-total
- daemonset-ready-percent
- deployment-ready-percent
- statefulset-ready-percent

Additional details on the above bulkstatistics is provided in [Appendix A: Bulkstatistic KPI Details](#).

Appendix A: Bulkstatistic KPI Details

system-mode

| | |
|----------------------------|-------------|
| Query Expression: | system_mode |
| Namespace Specific: | Y |
| Label: | |

| | |
|-----------------------------|--|
| Description: | Indicates if the system is running or shutdown. 1 is running, 0 is shutdown. |
| Unit: | Boolean |
| Type: | Gauge |
| Threshold of Normal: | 1 |

system-running-percent

| | |
|-----------------------------|---|
| Query Expression: | <code>system_running_percent</code> |
| Namespace Specific: | Y |
| Label: | |
| Description: | This percent of the system pods that are running currently. |
| Unit: | Percentage |
| Type: | Gauge |
| Threshold of Normal: | 100 |

configuration-change-total

| | |
|-----------------------------|---|
| Query Expression: | <code>configuration_change_total</code> |
| Namespace Specific: | Y |
| Label: | |
| Description: | This total number of configuration changes executed |
| Unit: | Changes |
| Type: | Counter |
| Threshold of Normal: | N/A |

cpu-core-count

| | |
|----------------------------|--|
| Query Expression: | <code>count(count(node_cpu_seconds_total) without (mode)) without (cpu)</code> |
| Namespace Specific: | N |

| | |
|-----------------------------|--------------------------------------|
| Label: | hostname |
| Description: | The total CPU cores on a given host. |
| Unit: | Cores |
| Type: | Gauge |
| Threshold of Normal: | N/A |

node-load-1

| | |
|-----------------------------|--------------------------------------|
| Query Expression: | node_load1 |
| Namespace Specific: | N |
| Label: | hostname |
| Description: | The Linux load1 value. |
| Unit: | Load |
| Type: | Gauge |
| Threshold of Normal: | Ratio < 1 compared to cpu-core-count |

node-load-5

| | |
|-----------------------------|--------------------------------------|
| Query Expression: | node_load5 |
| Namespace Specific: | N |
| Label: | hostname |
| Description: | The Linux load5 value. |
| Unit: | Load |
| Type: | Gauge |
| Threshold of Normal: | Ratio < 1 compared to cpu-core-count |

node-load-15

| | |
|----------------------------|-------------------------|
| Query Expression: | node_load15 |
| Namespace Specific: | N |
| Label: | hostname |
| Description: | The Linux load15 value. |

| | |
|-----------------------------|--------------------------------------|
| Unit: | Load |
| Type: | Gauge |
| Threshold of Normal: | Ratio < 1 compared to cpu-core-count |

node-disk-rate-read-bytes

| | |
|-----------------------------|--|
| Query Expression: | <code>sum(rate(node_disk_read_bytes_total[5m])) by (hostname)</code> |
| Namespace Specific: | N |
| Label: | hostname |
| Description: | The disk read byte rate (5 minute rate) for a host. |
| Unit: | Bytes |
| Type: | Gauge |
| Threshold of Normal: | Workload dependent |

node-disk-write-read-bytes

| | |
|-----------------------------|---|
| Query Expression: | <code>sum(rate(node_disk_written_bytes_total[5m])) by (hostname)</code> |
| Namespace Specific: | N |
| Label: | hostname |
| Description: | The disk write byte rate (5 minute rate) for a host. |
| Unit: | Bytes |
| Type: | Gauge |
| Threshold of Normal: | Workload dependent |

node-memory-free-bytes

| | |
|----------------------------|--|
| Query Expression: | <code>node_memory_MemFree_bytes</code> |
| Namespace Specific: | N |
| Label: | hostname |
| Description: | The bytes of free memory for a host |
| Unit: | Bytes |

| | |
|----------------------|-----------------|
| Type: | Gauge |
| Threshold of Normal: | < 1,000,000,000 |

network-transmit-bond-bytes-total

| | |
|----------------------|---|
| Query Expression: | sum(node_network_transmit_bytes_total{device=~"bond[0-9]"}) by (hostname) |
| Namespace Specific: | N |
| Label: | hostname |
| Description: | The bytes transmitted over the "bond" interfaces |
| Unit: | Bytes |
| Type: | Counter |
| Threshold of Normal: | |

network-receive-bond-bytes-total

| | |
|----------------------|--|
| Query Expression: | sum(node_network_receive_bytes_total{device=~"bond[0-9]"}) by (hostname) |
| Namespace Specific: | N |
| Label: | hostname |
| Description: | The bytes received over the "bond" interfaces |
| Unit: | Bytes |
| Type: | Counter |
| Threshold of Normal: | |

network-carrier-bond-changes-total

| | |
|----------------------|--|
| Query Expression: | sum(node_network_carrier_changes_total{device=~"bond[0-9]"}) by (hostname) |
| Namespace Specific: | N |
| Label: | hostname |
| Description: | The total instances of "bond" carrier changes. |
| Unit: | Changes |
| Type: | Counter |
| Threshold of Normal: | |

network-transmit-ens-bytes-total

| | |
|-----------------------------|--|
| Query Expression: | <code>sum(node_network_transmit_bytes_total{device=~"ens.*"}) by (hostname)</code> |
| Namespace Specific: | N |
| Label: | hostname |
| Description: | The bytes transmitted over the "ens" interfaces |
| Unit: | Bytes |
| Type: | Counter |
| Threshold of Normal: | |

network-receive-ens-bytes-total

| | |
|-----------------------------|---|
| Query Expression: | <code>sum(node_network_receive_bytes_total{device=~"ens.*"}) by (hostname)</code> |
| Namespace Specific: | N |
| Label: | hostname |
| Description: | The bytes received over the "ens" interfaces |
| Unit: | Bytes |
| Type: | Counter |
| Threshold of Normal: | |

network-carrier-ens-changes-total

| | |
|-----------------------------|---|
| Query Expression: | <code>sum(node_network_carrier_changes_total{device=~"ens.*"}) by (hostname)</code> |
| Namespace Specific: | N |
| Label: | hostname |
| Description: | The total instances of "ens" carrier changes. |
| Unit: | Changes |
| Type: | Counter |
| Threshold of Normal: | |

k8s-pods-status

| | |
|----------------------------|--|
| Query Expression: | <code>sum(kube_pod_status_phase) by (phase)</code> |
| Namespace Specific: | N |

| | |
|-----------------------------|--|
| Label: | phase |
| Description: | The total kubernetes pods by phase. Phases are "Running", "Pending", "Failed", "Succeeded" |
| Unit: | Pods |
| Type: | Gauge |
| Threshold of Normal: | |

active-alerts

| | |
|-----------------------------|---|
| Query Expression: | sum(ALERTS{alertstate="firing"}) by (alertname) |
| Namespace Specific: | N |
| Label: | alertname |
| Description: | The current active alerts. |
| Unit: | Alerts |
| Type: | Gauge |
| Threshold of Normal: | |

filesystem-root-avail-bytes

| | |
|-----------------------------|---|
| Query Expression: | avg(node_filesystem_avail_bytes{device="/dev/sda1"}) by (hostname) |
| Namespace Specific: | N |
| Label: | hostname |
| Description: | The current available bytes for root disk |
| Unit: | Bytes |
| Type: | Gauge |
| Threshold of Normal: | < 10,000,000,000 |

filesystem-data-avail-bytes

| | |
|----------------------------|---|
| Query Expression: | avg(node_filesystem_avail_bytes{device="/dev/vda1"}) by (hostname) |
| Namespace Specific: | N |
| Label: | hostname |
| Description: | The current available bytes for data disk |
| Unit: | Bytes |

| | |
|----------------------|------------------|
| Type: | Gauge |
| Threshold of Normal: | < 10,000,000,000 |

kubelet-running-pod-count

| | |
|----------------------|--|
| Query Expression: | kubelet_running_pod_count |
| Namespace Specific: | N |
| Label: | hostname |
| Description: | The current running pod count by host. |
| Unit: | Pods |
| Type: | Gauge |
| Threshold of Normal: | |

entitlement_status

| | |
|----------------------|--|
| Query Expression: | entitlement_status(enforce_mode!="InCompliance") |
| Namespace Specific: | N |
| Label: | tag |
| Description: | The current out of compliance entitlements. |
| Unit: | Int32 |
| Type: | Gauge |
| Threshold of Normal: | |

memory-used

| | |
|----------------------|---|
| Query Expression: | sum(node_memory_MemTotal_bytes) by (hostname) - sum(node_memory_MemFree_bytes) by (hostname) |
| Namespace Specific: | N |
| Label: | hostname |
| Description: | The bytes of used memory on the host. |
| Unit: | Int64 |
| Type: | Gauge |
| Threshold of Normal: | |

cpu-idle

| | |
|-----------------------------|--|
| Query Expression: | <code>avg(rate(node_cpu_seconds_total{mode="idle"}[1m])) by (hostname)*100.00</code> |
| Namespace Specific: | N |
| Label: | hostname |
| Description: | The 1 minute average CPU idle time on the node. |
| Unit: | Int64 |
| Type: | Gauge |
| Threshold of Normal: | |

cpu-softirq

| | |
|-----------------------------|---|
| Query Expression: | <code>avg(rate(node_cpu_seconds_total{mode="softirq"}[1m])) by (hostname)*100.00</code> |
| Namespace Specific: | N |
| Label: | hostname |
| Description: | The 1 minute average CPU softirq time on the node. |
| Unit: | Int64 |
| Type: | Gauge |
| Threshold of Normal: | |

cpu-system

| | |
|-----------------------------|--|
| Query Expression: | <code>avg(rate(node_cpu_seconds_total{mode="system"}[1m])) by (hostname)*100.00</code> |
| Namespace Specific: | N |
| Label: | hostname |
| Description: | The 1 minute average CPU system time on the node. |
| Unit: | Int64 |
| Type: | Gauge |
| Threshold of Normal: | |

cpu-iowait

| | |
|--------------------------|--|
| Query Expression: | <code>avg(rate(node_cpu_seconds_total{mode="iowait"}[1m])) by (hostname)*100.00</code> |
|--------------------------|--|

| | |
|-----------------------------|---|
| Namespace Specific: | N |
| Label: | hostname |
| Description: | The 1 minute average CPU iowait time on the node. |
| Unit: | Int64 |
| Type: | Gauge |
| Threshold of Normal: | |

cpu-steal

| | |
|-----------------------------|---|
| Query Expression: | <code>avg(rate(node_cpu_seconds_total{mode=\"steal\"}[1m])) by (hostname)*100.00</code> |
| Namespace Specific: | N |
| Label: | hostname |
| Description: | The 1 minute average CPU steal time on the node. |
| Unit: | Int64 |
| Type: | Gauge |
| Threshold of Normal: | |

cpu-user

| | |
|-----------------------------|--|
| Query Expression: | <code>avg(rate(node_cpu_seconds_total{mode=\"user\"}[1m])) by (hostname)*100.00</code> |
| Namespace Specific: | N |
| Label: | hostname |
| Description: | The 1 minute average CPU user time on the node. |
| Unit: | Int64 |
| Type: | Gauge |
| Threshold of Normal: | |

kubelet-node-status

| | |
|----------------------------|--|
| Query Expression: | <code>sum(kube_node_status_condition{status=\"true\"}) by (condition)</code> |
| Namespace Specific: | N |
| Label: | condition |
| Description: | The kubelet node status by condition. |

| | |
|----------------------|-------|
| Unit: | Int32 |
| Type: | Gauge |
| Threshold of Normal: | |

network-errors-total

| | |
|----------------------|---|
| Query Expression: | <code>sum(node_network_receive_errs_total) by (hostname)</code> |
| Namespace Specific: | N |
| Label: | hostname |
| Description: | The number of network errors by node. |
| Unit: | Int64 |
| Type: | Counter |
| Threshold of Normal: | |

daemonset-ready-percent

| | |
|----------------------|--|
| Query Expression: | <code>kube_daemonset_status_number_ready/kube_daemonset_status_desired_number_scheduled * 100</code> |
| Namespace Specific: | N |
| Label: | daemonset |
| Description: | The percent ready for the given daemonset. |
| Unit: | Float |
| Type: | Gauge |
| Threshold of Normal: | |

deployment-ready-percent

| | |
|----------------------|--|
| Query Expression: | <code>kube_deployment_status_replicas_available/kube_deployment_status_replicas * 100</code> |
| Namespace Specific: | N |
| Label: | deployment |
| Description: | The percent ready for the given deployment. |
| Unit: | Float |
| Type: | Gauge |
| Threshold of Normal: | |

statefulset-ready-percent

| | |
|-----------------------------|---|
| Query Expression: | <code>kube_statefulset_status_replicas_ready/ kube_statefulset_status_replicas * 100</code> |
| Namespace Specific: | N |
| Label: | statefulset |
| Description: | The percent ready for the given statefulset |
| Unit: | Float |
| Type: | Gauge |
| Threshold of Normal: | |

statefulset-ready-percent